PATENT CLAIMS

1. A method of selectively detecting and/or quantifying super paramagnetic and/or ferro magnetic particles, characterized in that based upon the nonlinearality of the magnetization characteristics of the particles, frequency components of magnetic fields generated by their magnetization are measured in terms of mixed frequencies.

2. The method according to claim 1, characterized in that the particles, for modulating their magnetization characteristics (5) , are subjected to a modulating magnetic field (4, 18) of predetermined frequency.

3. The method according to one of the preceding claims in which the modulating magnetic field (4, 18) has a frequency between 50 and 100 hertz.

4. The method according to one of the preceding claims characterized in that the particles are subjected to a scanning magnetic field (15) with a frequency different from the modulating magnetic field (4, 18).

5. The method according to one of the preceding claims in which the scanning magnetic field (15) has a frequency between 10 and 100 kilo hertz.

6. The method according to one of the preceding claims characterized in that a response magnetic field (19) of the particle induced by the effect of the two alternating magnetic fields (15, 18) thereon is measured.

7. The method according to one of the preceding claims, characterized in that the amplitude variation (8, 11) of the response magnetic field (19) is measured at the frequency of the scanning magnetic field (15).

8. The method according to one of the preceding claims in which the frequency components of the amplitude variation (8, 11) of the response magnetic field (19) at the frequency of the scanning magnetic field (15) are measured as whole number multiple of the frequency of the modulating magnetic field (4, 18).

9. The method according to one of the preceding claims in which the frequency components of the amplitude variation (8, 11) of the response magnetic field (19) to the frequency of the scanning magnetic field (15) are measured for the even number multiple of the frequency of the modulating magnetic field (4, 18).

10. The method according to one of the preceding claims in which the frequency components of the amplitude variation (8, 11) of the response magnetic field (19) to the frequency of the scanning magnetic field (15) is measured, for the signal which is twice the frequency of the modulating magnetic field (4, 18).

11. The method according to one of the preceding claims characterized in that the amplitude variation (11) of the response magnetic field (19) is converted and as an output voltage (24) is used to determine the concentration of the analyte.

12. A device for the selective detection and/or quantification of super power magnetic and/or thermal magnetic particles with analytes, comprising:

a vessel (12) with an analyte to be detected or to be quantified,

at least one oscillator (13, 16; 25) for producing frequencies of alternating magnetic fields (15, 18),

at least one field generator (14, 17) for subjecting the analyte to alternating magnetic field (15, 18),

a magnetic field sensor (20) for measuring a response magnetic field (19) of the particles, and

at least one phase sensitive detector (21, 23).

13. The device according to claim 12 comprising at least one frequency dividers (26, 27, 28, 29, 30) for dividing the frequency of the oscillator (25).

14. The device according to claim 13 characterized in that the frequency divider or frequency dividers (26, 27, 28, 29, 30) divide the oscillator frequency in proportions of whole positive numbers.

15. The device according to claim 13 or 14, characterized in that the frequency dividers (26, 27, 28) divide the oscillator frequency into the ratios

$$\frac{1}{\ell},$$

$$\frac{1}{m \cdot n}$$

$$\frac{1}{n}$$

16. The device according to one of claims 13 through 15 characterized in that the frequency dividers (28, 29, 30) divide the oscillator frequency in the ratios of

$$\frac{1}{n}$$

$$\frac{1}{n+m}$$

$$\frac{1}{n(n+m)}$$

17. The device according to one of the preceding claims 15 or 16 with whole positive numbers for l, m, n.

18. The device according to one of the preceding claims 15 - 17 with m as an even number, especially with m=2.

19. The device according to one of the preceding claims 13 - 18 with at least one frequency divider (26, 28) dividing the oscillator frequency into a reference frequency which is stored in at least one phase sensitive detector (21, 23).

20. The device according to one of the preceding claims 13 - 19 in which a frequency from one frequency divider (26) of the oscillator frequency is stored as a reference in one phase sensitive detector (21) and a frequency from another frequency divider (28) dividing the oscillator frequency is stored as a reference in another phase sensitive detector (23).

21. The device according to one of the preceding claims 13 - 20, characterized in that field generators (14, 17) are provided which are controlled by the frequencies of the frequency dividers (26, 27; 29, 30).

22. The device according to one of the preceding claims 12 - 21 comprising at least one frequency multiplier (22).

23. The device according to one of the preceding claims 12 - 22, characterized in that the magnetic field sensor (20) is configured as a differential field sensor.

24. The device according to one of the preceding claims 12 - 23, characterized in that the magnetic field sensor (20) comprises two partial coils of the same construction type.

25. The device according to one of the preceding claims 12 - 24, characterized in that the partial coils of the magnetic field sensor (20) are wound in opposite sensors.

26. The device according to one of the preceding claims 12 - 25 characterized in that the partial coils of the magnetic field sensor (20) are connected in series.

27. The device according to one of the preceding claims 12 - 26, characterized in that the container with the analyte is in contact with only one of the two partial coils of the magnetic field sensor (20).

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